



General Certificate of Secondary Education
2024–2025

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1

Higher Tier



[GDW12]

GDW12

WEDNESDAY 26 FEBRUARY 2025, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete questions in black ink and use a dark HB pencil for drawings and graphs.

Do not write with a gel pen.

Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You may use a scientific calculator.

Quality of written communication will be assessed in Question **2(b)**.

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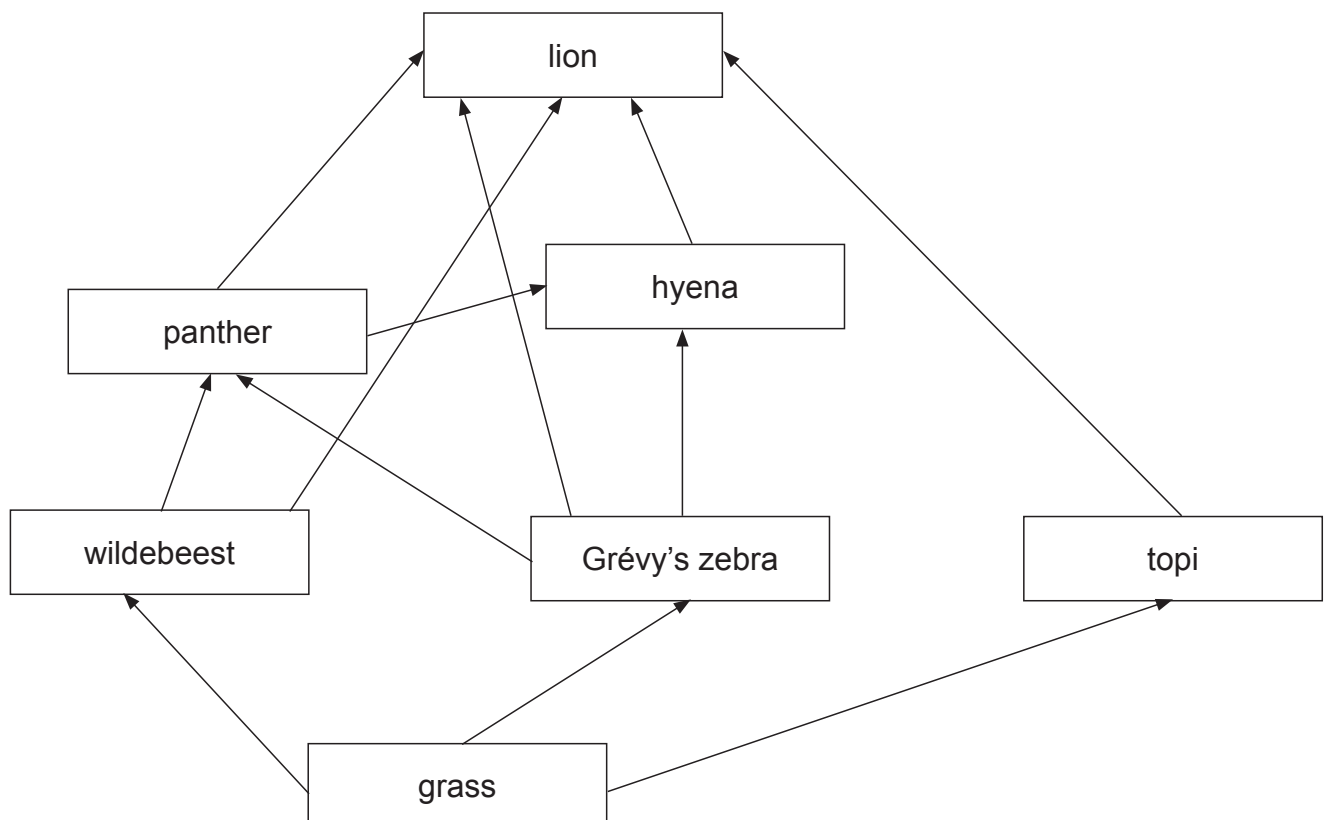
24GDW1201

- 1 There are three species of zebra found in Africa.

The photograph shows one of these species, the Grévy's zebra.



The diagram shows a food web for Grévy's zebra.



(a) Use the food web to complete the table to give the position(s) of the organisms in this food web.

Write a tick (✓) in the correct empty boxes.

Organisms may be in one, or more than one, position.

Organism	Producer	Primary consumer	Secondary consumer	Tertiary consumer
Grévy's zebra				
panther				
hyena				
grass				

[5]

(b) A drought occurs when there is no rainfall for several months.

Drought causes a decrease in the grass population.

This can result in a decrease in the panther population.

Explain why the **panther** population could decrease.

[3]

[Turn over



(c) Scientists have been monitoring the Grévy's zebra population in Africa.

In the 1970s there were 15 156 Grévy's zebras.

Since then, their population has declined by 80%.

Calculate the current population of Grévy's zebra.

Show your working out.

Give your answer to the nearest whole number.

_____ [4]





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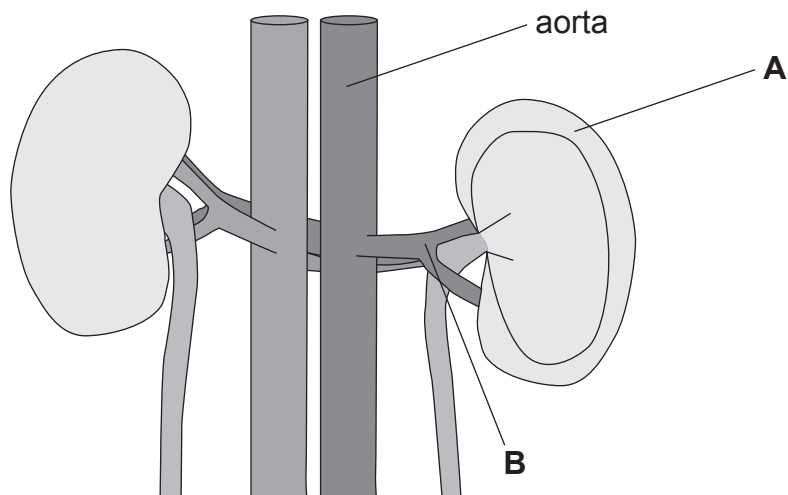
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[Turn over



24GDW1205

2 The diagram shows part of the excretory system.



(a) (i) Name the outer region of the kidney labelled **A**.

[1]

(ii) Name blood vessel **B** that carries blood **into** the kidney.

[1]



The body maintains water balance in the process of osmoregulation.

(b) Describe how water is gained and lost by the body.

In this question you will be assessed on the quality of your written communication skills, including the use of specialist scientific terms.

How water is gained by the body _____

How water is lost by the body _____

[6]

[Turn over



3 A student carried out an investigation into the decomposition of leaves.

(a) Name **two** types of microorganisms that cause decomposition.

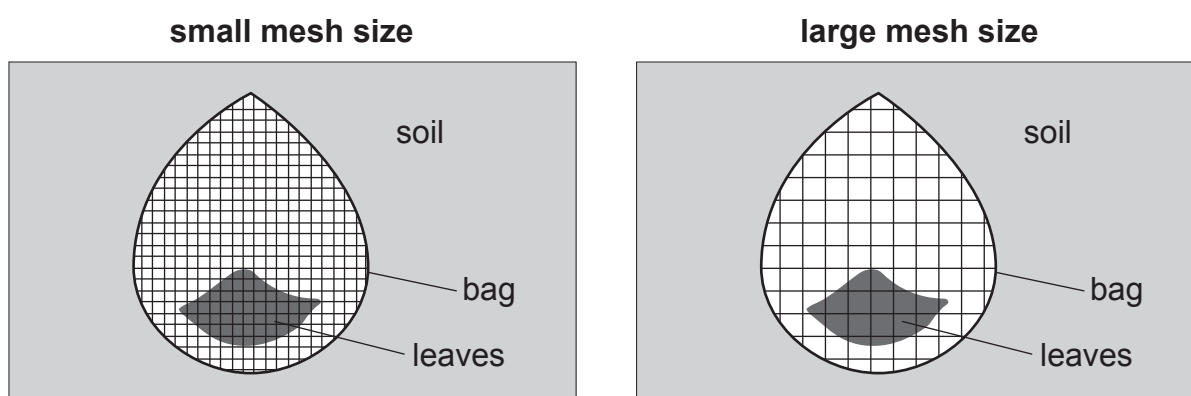
_____ and _____ [2]

(b) The student used three bags, with the same mass of leaves in each bag.

The leaves were all the same type.

The three bags, **A**, **B** and **C**, had different mesh sizes.

The diagram shows the different mesh sizes in two of the bags.



The student buried the bags in the same depth of soil in June.

The percentage (%) mass of leaves **remaining** in each bag was measured in August, October and December.

Table 1 shows his results.

Table 1

Month	Percentage (%) mass of leaves remaining		
	bag A	bag B	bag C
June	100	100	100
August	50	90	97
October	5	84	96
December	4	80	95



- (i) Use the results in Table 1 to complete Table 2 below.

Write a tick (✓) in the box that applies to each statement.

Table 2

Statement	True	False	Cannot tell
bag B had the greatest mass of leaves decomposed			
bag A had the fastest rate of decomposition			
the same rate of decomposition would occur in a different soil			
the rate of decomposition would have been faster if a different type of leaf had been used			

[4]

- (ii) Use the results in Table 1 to suggest which bag, **A**, **B** or **C**, had the **smallest** mesh size.

Explain your answer.

Bag _____

Explanation _____

_____ [2]

- (c) (i) Between which two months was the rate of decomposition the **slowest** for all bags?

_____ and _____ [1]

- (ii) Suggest **one** reason why the rate of decomposition was slowest at this time of year.

_____ [1]

[Turn over

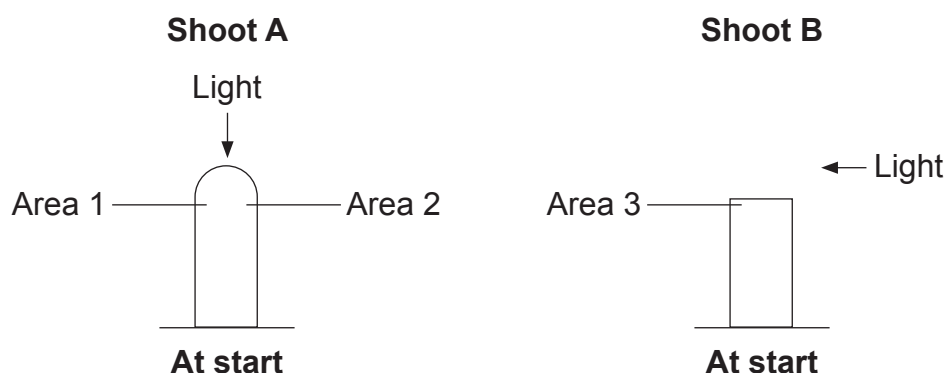


- 4 (a) A scientist carried out an experiment to investigate the growth response to light in plant shoots.

The diagram shows the set-up of his experiment.

Shoot **A** had light shining on it from above.

Shoot **B** had light shining on it from the right-hand side **and** the tip of the shoot was cut off.

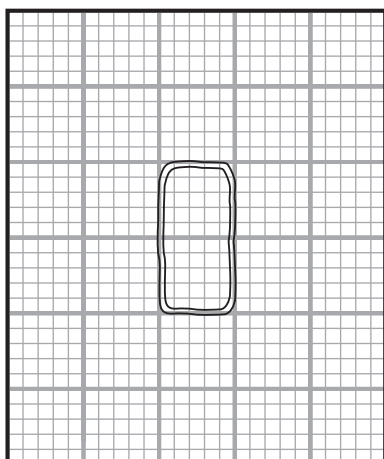


Both shoots were then left for two days.

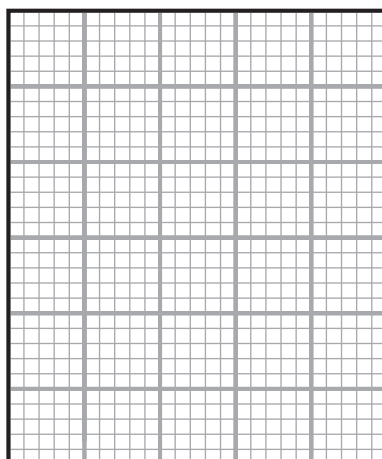
A typical cell from **Area 1** and **Area 2** of shoot **A** at the start of the experiment has been drawn on the first grid below.

- (i) On the second and third grids below, draw a cell that you would expect to find in **Area 1** and **Area 2** after two days.

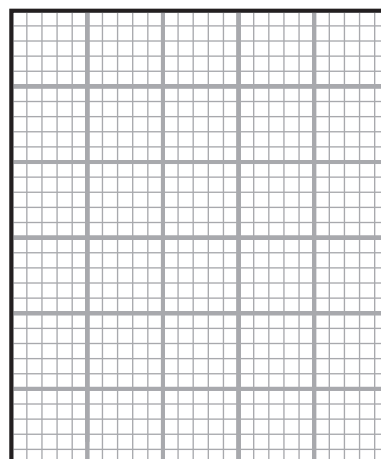
Cell from **Area 1** and **Area 2** at the start



Cell from **Area 1** after two days



Cell from **Area 2** after two days



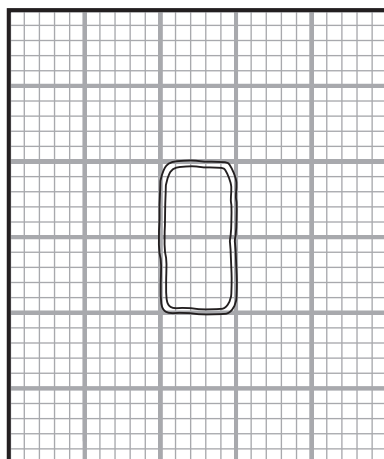
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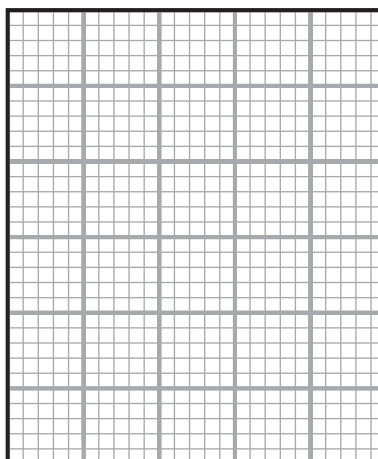
- (ii) A cell from **Area 3** of shoot **B** at the start of the experiment has been drawn on the first grid below.

On the second grid below, draw a cell that you would expect to find in **Area 3** after two days.

Cell from **Area 3**
at the start



Cell from **Area 3**
after two days



[1]

- (b) Explain the response that produced the cell from **Area 3** in shoot **B** after two days.

[3]

[Turn over]



5 Pollen breathed in through the nose can cause sneezing which is a **reflex action**.

(a) Write one word on each line in the sentences below to complete the flow diagram about this **reflex action**.

Pollen is the _____ which triggers a reflex action.



_____ in the nose detect the pollen.



_____ neurones pass an impulse to the central nervous system.



The impulse then passes along an association neurone in the _____ to the last neurone in the reflex arc.

[4]

(b) Give **two** differences between a voluntary action and a reflex action.

1. _____

2. _____

[2]





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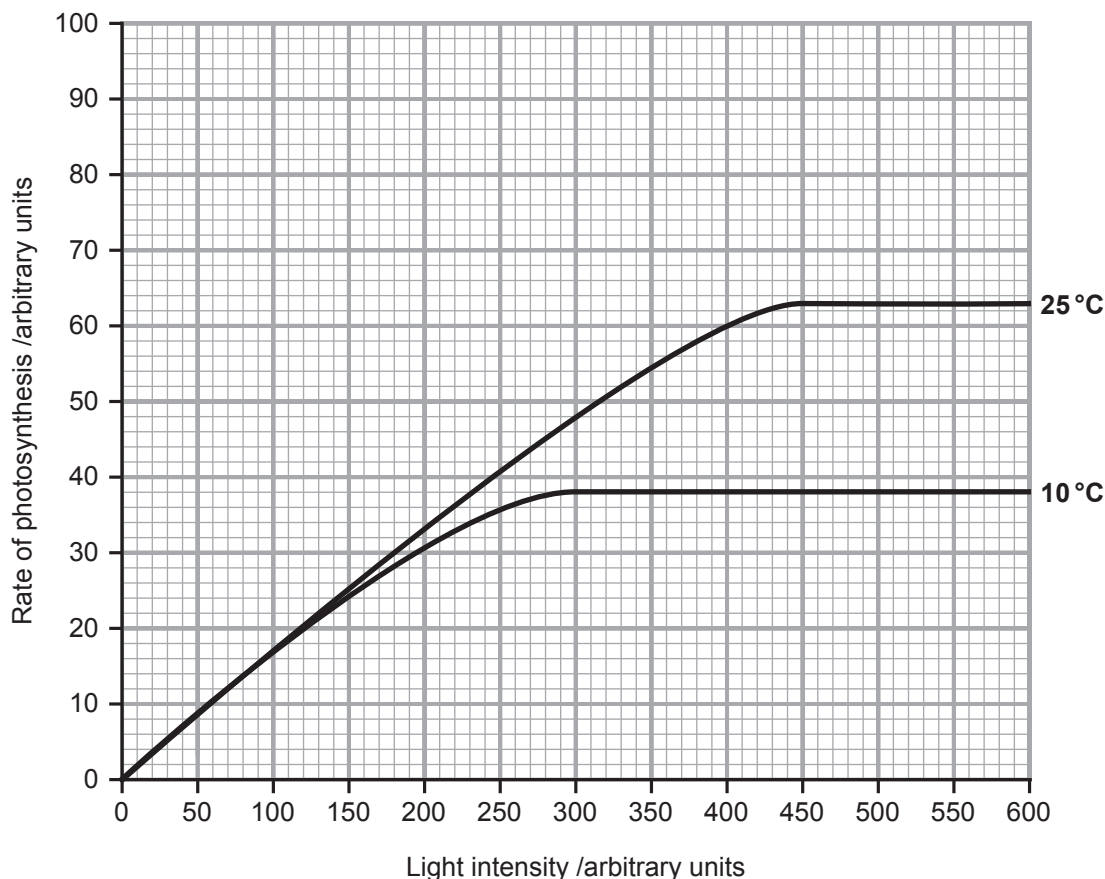
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24GDW1213

- 6 (a) A scientist investigated how the rate of photosynthesis in a plant was limited by environmental factors.

The graph shows the effect of light intensity on the rate of photosynthesis in a plant at temperatures of 10°C and 25°C .



- (i) Give the limiting factor when the light intensity was 100 arbitrary units.
- _____ [1]
- (ii) Give the limiting factor when the light intensity was 550 arbitrary units and the temperature was 10°C .
- _____ [1]
- (iii) Name the **other** environmental factor that could limit the rate of photosynthesis.
- _____ [1]



- (b) Calculate the difference in the rate of photosynthesis between 10 °C and 25 °C when the light intensity was 550 arbitrary units.

Show your working out.

_____ arbitrary units [2]

- (c) The scientist repeated the experiment at 25 °C with a different type of plant that contained less chlorophyll in its leaves.

Suggest what effect, if any, this would have on the maximum rate of photosynthesis in this plant.

Explain your answer.

Effect on rate of photosynthesis _____

Explanation _____

_____ [2]

[Turn over]



7 The nitrogen cycle involves several different types of bacteria.

(a) Give the role of nitrifying bacteria.

[1]

Soil contains millions of bacteria involved in the nitrogen cycle.

The table shows the numbers of different types of these bacteria in samples from four different soils, **A**, **B**, **C** and **D**.

Type of bacteria	Numbers of bacteria			
	soil A	soil B	soil C	soil D
nitrogen-fixing	450	500	90	140
nitrifying	350	400	110	160
denitrifying	200	100	800	700

(b) (i) Use the information in the table to give the soil, **A**, **B**, **C** or **D** which had the **highest nitrate** content.

Explain your answer.

Soil _____

Explanation _____

[3]



- (ii) Use the information in the table to suggest which soil, **A**, **B**, **C** or **D**, had the **lowest oxygen** content.

Explain your answer.

Soil _____

Explanation _____

[3]



8 Eutrophication in a river can be caused by fertiliser run-off.

- (a) (i) Name the mineral in fertiliser run-off that causes increased growth in aquatic plants and algae.

[1]

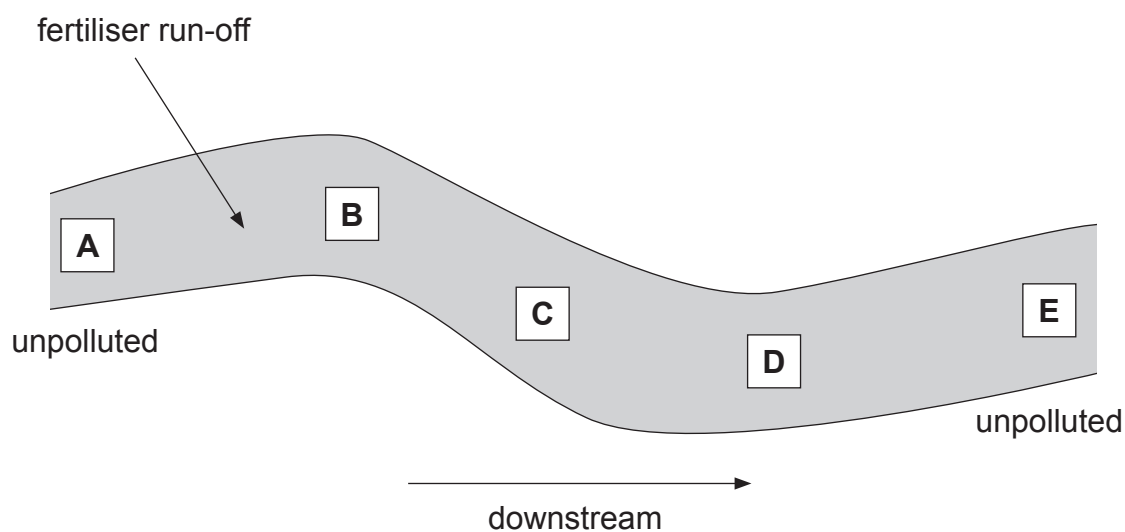
- (ii) Explain why this mineral causes growth of aquatic plants and algae.

_____ [1]

In an investigation, a scientist collected water samples from five points (A, B, C, D and E) along a river.

The river had been polluted by fertiliser run-off.

The diagram shows the river and the five sampling points.



- (b) The scientist carried out a pollution test on all five water samples.

The pollution test gave the amount of oxygen **used** by microorganisms in the water samples.



- (i) Complete the sentence to describe the role of the microorganisms in the river.

Microorganisms used the oxygen in the process of

_____ when they decomposed

the _____ .

[2]

- (ii) Use a ruler to draw a straight line from the letter of the sampling point to the amount of oxygen **used** by microorganisms at **each** sampling point.

The line for sampling point **A** has been completed for you.

Sampling point	Amount of oxygen used by microorganisms
A	8
B	1
C	2
D	6
E	1

[2]

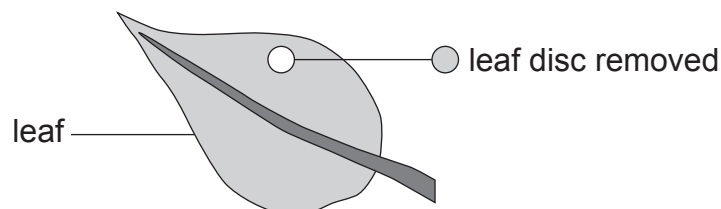
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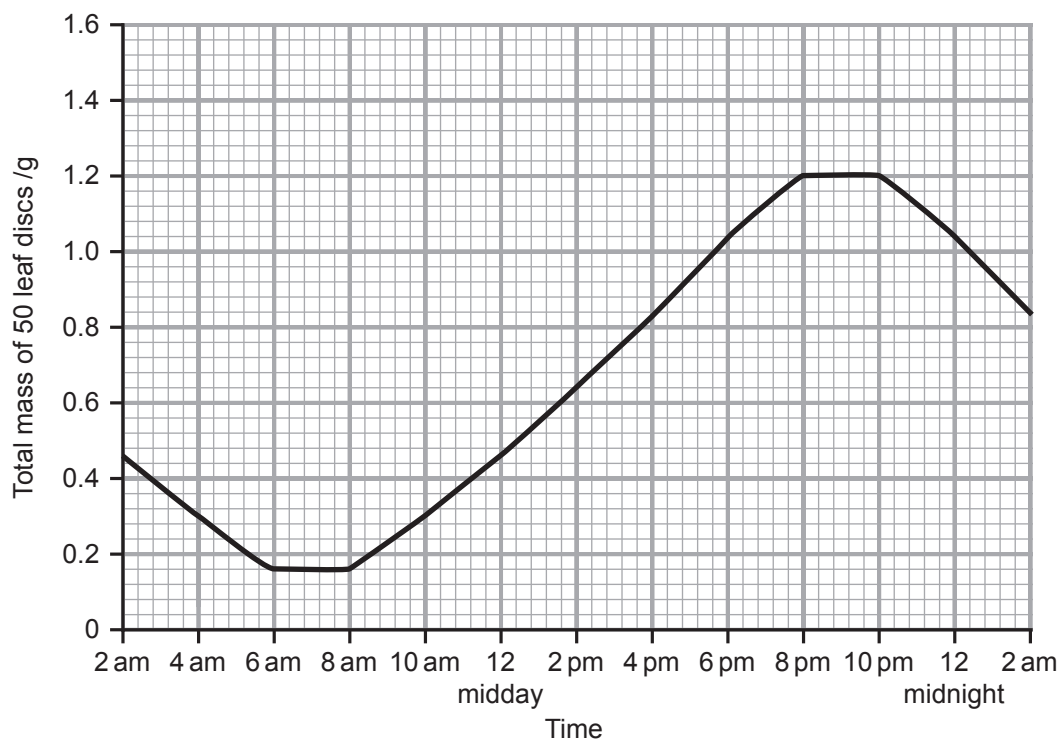
- 9 A student carried out an investigation into photosynthesis and respiration in a plant during the summer.

She cut 50 leaf discs from the plant every two hours over a 24 hour period. She weighed the leaf discs and recorded their total mass.

The diagram shows a leaf from the plant with one leaf disc removed.



The graph shows the student's results.



Statements about the investigation are given in list 1, list 2 and list 3.

List 1

Number	Statements about the total mass of the leaf discs
1	the total mass increased
2	the total mass decreased
3	the total mass stayed the same



List 2

Number	Statements about photosynthesis and respiration
4	only respiration occurred
5	only photosynthesis occurred
6	the rate of photosynthesis was greater than the rate of respiration
7	the rate of photosynthesis was lower than the rate of respiration
8	the rate of photosynthesis was the same as the rate of respiration

List 3

Number	Statements about glucose
9	more glucose was produced than used
10	glucose was used and none produced
11	the same amount of glucose was produced as was used

Use the graph and your knowledge to complete the table below.

- (a) Give the number of **one** statement from **list 1**, **one** statement from **list 2** and **one** statement from **list 3** that applies to each two-hour time period.

Write your answers in the empty boxes.

Time period	Number of statement from:		
	List 1	List 2	List 3
2 am to 4 am			
4 pm to 6 pm	1	6	
8 pm to 10 pm			

[7]

[Turn over



The student repeated the investigation in **winter** with the same plant.

She found that the total mass of 50 leaf discs was **lower** in each two-hour time period in winter.

(b) Circle the statement in the list that explains these results.

it was warmer and the nights were shorter

it was colder and the nights were longer

it was colder and the nights were shorter

[1]

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Sources:

Question 1: © Getty Images

Question 2: Principal Examiner

Question 3(b): Principal Examiner

Question 4(a): Principal Examiner

Question 8(b): Principal Examiner

Question 9(a): Principal Examiner

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Question Number	Marks
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Examiner Number

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